Chapter Forty-one

CONSTRUCTION SITE STORM WATER POLLUTION CONTROL

BUREAU OF DESIGN AND ENVIRONMENT MANUAL

Chapter Forty-one
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CONSTRUCTION SITE STORM WATER POLLUTION CONTROL

41-1 INTRODUCTION

41-1.01 Background

Storm water runoff occurs naturally as part of the hydrologic cycle. Site development alters the drainage characteristics and patterns of the landscape through increased imperviousness, restructured contours, altered soils and vegetation, etc. These impacts include changes to the quantity, quality, and timing of storm water being discharged from the altered landscape; increased flooding; and increased concentrations of pollutants in lakes, rivers, streams, and reservoirs. For decades, these impacts have been addressed using storm water detention facilities designed to capture and detain runoff from the site post construction.

Recently, however, more focus has been given to improving the quality of storm water being discharged during the construction process. Significant pollutant loads have been shown to contribute to the degradation of water quality during development due to the temporary vulnerability of the exposed soils to erosion before permanent stabilization is achieved.

41-1.02 Purpose, Scope, and Organization

Chapter 41 provides guidance in meeting State and Federal requirements for preventing pollution of waterways, the roadway and associated rights-of-way, adjacent properties, and sensitive environmental resources (e.g., floodplain, wetlands and riparian areas, habitat of threatened and endangered species) during highway construction projects. Comprehensive pollution prevention involves thorough planning and proper selection, implementation, and maintenance of pollution prevention best management practices (BMP) that are designed to reduce or eliminate the introduction of target pollutants from construction sites to receiving waters. Design information is provided to assist in the BMP selection process. Section 41-4 provides guidance for developing the design portion of a site-specific storm water pollution prevention plan (SWPPP), as per National Pollutant Discharge Elimination System (NPDES) requirements.

41-1.03 Acronyms

BDE. Bureau of Design and Environment
BMP. Best Management Practice
ECB. Erosion Control Blanket
ECP. Erosion Control Practice

ESCP. Erosion and Sediment Control Plan
FEMA. Federal Emergency Management Agency
IDOT. Illinois Department of Transportation
IEPA. Illinois Environment Protection Agency
ISTHA. Illinois State Toll Highway Authority
IWPA. Interagency Wetlands Policy Act
MS4. Municipal Separate Storm Sewer System
NOI. Notice of Intent
NPDES. National Pollutant Discharge Elimination System
PAM. Polyacrylamide
RR. Rip Rap
SCP. Sediment Control Practices
Standard Specifications. *Standard Specifications for Road and Bridge Construction*
STD. Standard Drawing
SWPPP. Storm Water Pollution Prevention Plan
TRM. Turf Reinforcement Mat
USEPA. United States Environment Protection Agency

41-1.04 Regulatory Framework

41-1.04(a) Federal Requirements

The National Pollutant Discharge Elimination System (NPDES) is a Federal program, under Section 402 of the *Clean Water Act*, designed to improve the quality of the nation's surface water resources. The NPDES program controls water pollution by regulating the discharge of pollutants into waters of the United States. The NPDES program is administered by the US Environmental Protection Agency (USEPA) or authorized States.

One component of the NPDES program targets storm water discharges from municipal and industrial sites, including discharges associated with construction activities. The program seeks to reduce pollutants found in storm water runoff by prohibiting the discharge of pollutants unless a NPDES permit is obtained and the site maintains compliance with the permit conditions.

41-1.04(b) State Requirements and IDOT Responsibilities

In Illinois, the NPDES stormwater permitting program is administered by the Illinois Environmental Protection Agency (IEPA). IEPA issues two general NPDES permits for the discharge of storm water — ILR10 and ILR40. The ILR10 is a general permit that provides requirements for storm water discharges from construction site activities that meet or exceed the threshold for permit applicability (e.g., one acre of disturbed land area), while the ILR40 is a general permit for storm water discharges from small municipal separate storm sewer systems (MS4). Individual NPDES permits may be required by IEPA for extensive construction activities that discharge to critical receiving waters or as otherwise deemed necessary by IEPA. This Chapter provides design guidance for pollution prevention strategies consistent with the requirements of the ILR10 general permit. Individual permits may require design guidance

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beyond the scope of this Chapter. Meeting the conditions of the general permits covered within Chapter 41 tend to cost less and require less effort than individual permits.

The main components of the ILR10 permit are the required preparation of a SWPPP and submittal of a Notice of Intent (NOI). The SWPPP identifies potential sources of pollution associated with the construction site activity and describes the pollution prevention BMPs that will be used to reduce the likelihood of those pollutants being discharged from the site. The NOI includes a brief description of the project, estimates of the number of acres (hectares) of the site on which soil will be disturbed, and a certification that a SWPPP will be prepared prior to the start of construction.

The ILR40 permit requires operators of small MS4s to develop a Storm Water Management Program for the management of storm water within their jurisdiction. The term MS4 has a broad application that applies to universities, local sewer districts, hospitals, military bases, parks, and prisons, as well as State departments of transportation and municipally owned storm sewer systems. The *Code of Federal Regulations* defines a MS4 as a conveyance or a system of conveyances, which includes roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains that are owned or operated by a State, city, town, borough, county, parish, district, association, or other public body.

While IDOT is not a municipality, its extensive storm sewer system functions similarly to the MS4s of small municipalities and, therefore, requires coverage under the NPDES ILR40 permit. IDOT's Storm Water Management Program (Plan) has been developed and is maintained by the Department's Storm Water Committee. This plan addresses the following six minimum control measures:

- public education and outreach on storm water impacts,
- public involvement/participation,
- illicit discharge detection and elimination,
- construction site storm water runoff control,
- post-construction storm water management in new development and redevelopment, and
- pollution prevention/good housekeeping for municipal operations.

Upon submittal of a NOI, any MS4 covered by the ILR40 permit is also granted automatic coverage under the ILR10 for the discharge of storm water associated with construction site activities. The permittee must comply with the requirements of the ILR10 for all construction projects.

The focus of Chapter 41 is to address elements in the 4th minimum control measure, construction site storm water runoff control. Regarding this minimum control measure, the

ILR40 permit states that the Plan must include the development and implementation of, at a minimum:

- an ordinance or other regulatory mechanism to require erosion control practices (ECP) and sediment control practices (SCP) and sanctions to ensure compliance to the extent allowable under State or local law;
- requirements for construction site operators to implement appropriate ECPs and SCPs;
- requirements for construction site operators to control waste (e.g., discarded building materials, concrete truck washout, chemicals, litter, sanitary waste at the construction site) that may cause adverse impacts to water quality;
- require all regulated construction sites to have a SWPPP that meets the requirements of Part IV of the NPDES permit ILR10 including management practices, controls, and other provisions at least as protective as the requirements contained in the *Illinois Urban Manual*.
- procedures for site plan review that incorporate consideration of potential water quality impacts and review of individual preconstruction site plans to ensure consistency with local sediment and erosion control requirements;
- procedures for receipt and consideration of information submitted by the public; and
- procedures for site inspections and enforcement of control measures.

Sections 41-2 and 41-3 provide guidance on selection and implementation of ECPs and SCPs. Section 41-4 provides guidance for developing a SWPPP for IDOT construction projects. The nature and extent of the control measures should be appropriate to address the specific conditions involved and the measures must be properly maintained to ensure continued effective operation.

41-1.04(c) Applicability and Exemptions

IDOT must comply with the requirements of the current ILR10 permit or individual permit for all applicable State highway projects. Provided the proposed project meets the ILR10 permit applicability criteria, IDOT submits a NOI and develops and implements a SWPPP for applicable projects. Unless notified by IEPA to the contrary, IDOT is authorized to discharge storm water from construction sites 30 days after the date the NOI is received by IEPA. This requirement should be considered when developing a construction schedule for time-sensitive projects. ILR10 permit applicability extends to storm water discharges associated with construction activities on sites that:

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- disturb 1 acre (0.4 ha) or more of total land area;

- disturb less than 1 acre (0.4 ha) of total land but are part of a larger common plan of development or sale if the larger common plan will ultimately disturb one or more acres (0.4 ha or more hectares) of total land area; or

- disturb less than 1 acre (0.04 ha) of total land and are designated by IEPA to have the potential for contribution to a violation of water quality standards or significant contribution of pollutants to waterways. This includes waters designated by the IEPA as "impaired waters" pursuant to Section 303(d) of the *Clean Water Act*; see Section 26-21. This designation may be determined during the process of acquiring a water quality certification.

Construction projects not meeting any of the above and those that do not involve clearing and grubbing, excavation, stockpiling of topsoil, borrow, or construction of embankments will generally not require a SWPPP or Erosion and Sediment Control Plan sheets (ESCP). However, the design is to include any applicable pollution prevention BMPs necessary to minimize the potential for pollutants to enter IDOT's MS4 or other waters of the State. The following projects are examples of construction activities that will not require development of a SWPPP or ESCP:

- installation of lighting, signage, traffic signals, or guardrails;
- herbicide application;
- pavement marking;
- seal coating;
- bituminous resurfacing;
- pavement patching; and
- planting of woody landscaping materials.

41-1.05 Typical Construction Activity Related Pollutants

41-1.05(a) Overview

Construction activities involving earthwork (e.g., clearing and grubbing, grading, importing fill material, utility installation) disturb the soil that when the protective vegetation is removed the soil becomes exposed and vulnerable to excessive erosion. This makes the sediment the most common pollutant associated with construction activities. Sediment can be detrimental to aquatic life by interfering with photosynthesis, respiration, growth, reproduction, and oxygen exchange in waterways. In addition, sediment particles can transport other pollutants that are attached to them including nutrients, trace metals, and hydrocarbons. Sediment particles (e.g., silts, clays) are the primary components of total suspended solids, a common water quality parameter.

Construction activities involving building materials, vehicular use, and landscaping have the potential to contribute pollutants to storm water. Common pollutants related to these construction activities include vehicle fluids, curing compounds, solvents, paints, emulsions, oil

and grease, metals, organics, pesticides, nutrients, trash, debris, and floatables, as well as other miscellaneous waste.

41-1.05(b) Erosion and Sedimentation

Erosion is the process of soil particle detachment from the land surface by the forces of wind, water, or gravity. After the soil particles have been detached (eroded), the suspended soil particles in transport are referred to as sediment. Sedimentation occurs where suspended sediment settles out and is deposited. Note that gravels and sands tend to drop out of suspension more rapidly than finer particles (e.g., silts, clays) due to differences in size, density, and shape.

Where soil is cleared or disturbed, erosion occurs at a much higher rate due to direct exposure to erosive forces (e.g., raindrop impacts, sheet erosion, rill erosion). Land clearing disturbances can also alter the natural structure of soil and weaken the reinforcing matrix of plant roots and organic compounds. USEPA estimates that unprotected construction sites can experience erosion at over one hundred times the natural rate. As result, primary emphasis should be placed on ECPs as they are preventative source controls, while SCPs are secondary measures designed to contain sediment after it is in transport, preventing it from leaving the site.

41-1.05(c) Types of Erosion

1. Erosion from Raindrop Impact. The dislodgement of soil particles by falling raindrops is a primary agent of erosion, particularly on soils with sparse vegetative cover. Individual soil particles can be splashed over 1.5 ft (500 mm) in height and 5 ft (1.5 m) to the side.

2. Sheet Erosion. Splashed soil particles are moved in a semi-suspended layer uniformly over the land surface. The distance of sheet flow depends on slope, soil roughness, type of vegetative cover, and rainfall intensity.

3. Rill and Gully Erosion. As runoff concentrates, tiny channels form that are termed rills. Rill erosion is the form that produces the greatest amount of soil loss worldwide. Rills are channels small enough to be smoothed by normal tillage. As the runoff accumulates in the rills, they erode further, causing gullies to form. Gullies are so large that they cannot be smoothed by normal tillage. The rate of rill erosion can easily be one hundred times greater than that of sheet flow, and the rate of gully erosion can easily be one hundred times greater than rill erosion. Due to the significant amount of sediment generated by rill and gully erosion, these types of erosion must be given top priority for elimination, reduction, and control.

41-1.06 The BMP Approach/Limitations to Addressing Water Quality Problems

The goal of the Department's NPDES Storm Water Permit Program is to improve water quality by reducing the amount of pollutants in storm water runoff that are conveyed to receiving waters. The Department's program is using the BMP approach to meet this goal.

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A pollution prevention BMP is a technique, measure, or structural control that is used for a given set of site conditions to manage the rate, quantity, and quality of storm water runoff in a cost-effective manner. No single BMP can address all pollutants associated with construction activities. Sections 41-2 and 41-3 explores two categories of BMPs — ECPs and SCPs. Independently, these BMPs serve different purposes. Erosion control is a preventative strategy that uses techniques to stabilize the soil, thereby minimizing the occurrence of erosion. Sediment control is a backup strategy that incorporates structural measures to contain sediment on site in the event that erosion does occur. While functionally different, these BMPs should be selected and implemented in a complimentary manner in order to maximize pollution prevention effectiveness.

Each type of BMP has certain limitations based on drainage area served, available land space, cost, pollutant removal efficiency, as well as a variety of site-specific factors (e.g., soil types, slopes, depth of groundwater table). Careful consideration of these factors is necessary in order to select the appropriate BMP or group of BMPs for a particular location. The success of the program relies on the assumption that proper implementation of appropriate pollution prevention BMPs will achieve and maintain applicable water quality standards and protect designated uses. However, additional measures (e.g., treatment of polluted runoff) may be required in the future if these BMPs fall short of the program goals.

Chapter 41 provides guidance for selecting appropriate BMPs to mitigate water pollution as a result of construction activities. Designers are to use the IDOT specification listed for each BMP. If an IDOT specification is not listed, use the associated *Illinois Urban Manual* specification to develop a special provision for the project.

Section 41-4 provides guidance for completing the design portion of the SWPPP (Form BDE 2342).

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41-2 EROSION CONTROL PRACTICES – STABILIZATION

All erosion control practices (ECP) selected should consider seasonal influences on BMP effectiveness, installation, and maintenance throughout the duration of the project. For example, stabilization practices that may be effective in the summer may not be sufficient for the winter season (e.g., vegetation establishment).

41-2.01 Vegetation

Vegetation-related BMPs are some of the most effective and economic methods of soil stabilization. Vegetative cover protects soils from raindrop impacts, rill and sheet erosion, and wind erosion. Vegetation also provides a reduction in velocities, valuable filtration and adsorption of pollutants, and can reduce runoff volumes by enhancing infiltration.

41-2.01(a) Incorporate Existing Vegetation

1. Definition and Purpose. Measures taken to use existing vegetation as part of erosion control throughout construction activities. The purpose of this practice is to preserve areas that have value for erosion control.

2. Applications. Existing vegetation is appropriate for the following applications:

   - projects where grading can be phased,
   - projects where existing vegetation can be temporarily preserved and used for erosion control,
   - areas along the perimeter of the site, and
   - areas where upstream tributary sheet flow enters the site.

3. Design Considerations.

   - Minimize disturbance along the project where no construction activity is planned or will occur at a later stage/phase/date. If greater than 10 acres (4 ha) are to be disturbed at any one time to properly construct a project, a special provision will be required to modify Section 280.03 of the *Standard Specifications*.
   - Construction activities, heavy equipment, vehicular traffic, or storage of construction materials are prohibited within the vegetated areas designated for erosion control.
   - Use of existing vegetation for erosion control requires planning and may limit the area available for construction activities.

- See Sections 59-6.03 and 59-6.04 for further information on incorporating existing vegetation for erosion control.

4. Specifications. See Sections 201 and 280 of the *Standard Specifications*.

41-2.01(b) Establish New Vegetation

1. Definition and Purpose. Establishing temporary or permanent vegetative cover to stabilize disturbed or exposed areas in order to reduce erosion from these areas and create a landscape that enhances soil permeability and the filtering of runoff pollutants.

2. Applications.

   a. Temporary. Temporary locations include the following:

      - all cleared, non-vegetated, or sparsely vegetated soil surfaces where vegetative cover is necessary for less than one year (e.g., diversions, dams, temporary sediment basins, temporary road banks, topsoil stockpiles, any other exposed areas of a construction site);
      - sites that will not be brought to final grade within seven days or are likely to be re-disturbed;
      - cut and fill slopes under construction;
      - soil storage areas and stockpiles; and
      - where development of cover or nursery crops are necessary to assist with establishment of perennial grasses.

   b. Permanent. Permanent locations include the following:

      - disturbed areas where long-lived vegetative cover is needed to stabilize the soil,
      - rough graded areas that will not be brought to final grade for a year or more,
      - final graded or cleared areas where permanent vegetative cover is needed to stabilize the soil, and
      - drainage channels or waterways designed to be protected with channel liners.

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3. Design Considerations.

- Rapidly growing annuals and legumes are recommended examples of temporary vegetation for disturbed soils.
- Erosion may occur during the establishment stage; therefore, areas that fail may need to be re-seeded or seeded in conjunction with additional stabilization practices; see Section 41-2.02.
- Consider the state of the project as the growing season ends.
- Perform seeding during the appropriate season in order to ensure rapid establishment of vegetation. Sufficient moisture conditions may not be present at time of seeding to support timely germination of the seed. If unusually dry (drought) conditions are predicted, a special provision for supplemental watering may need to be included in the contract.
- Sod can provide a quick, but relatively expensive, method for establishing vegetation.
- For seeding and sodding design guidance, see Section 59-7, Section 280.04(f) of the *Standard Specifications*, and Figure 41-2.A.
- Calculate the quantity of temporary erosion control seeding for weekly seeding of estimated acreage (hectares) of disturbance.
- In the event that temporary or permanent vegetation cannot be established prior to winter shutdown, include erosion control measures (e.g., installation of mulch or ECBs on any exposed soil, slopes, and around the perimeter of the site) in the contract. Also, include measures to maintain these areas over the winter.

4. Specifications. See Sections 250, 252, and 280 of the *Standard Specifications*.

41-2.02 Mulch, Erosion Control Blankets, and Turf Reinforcement Mats

Mulch, erosion control blankets, and turf reinforcement mats are ECPs that can be employed in situations requiring stabilization of exposed soils before and during establishment of vegetation. These BMPs protect against raindrop impact and enhance vegetative establishment by retaining soil moisture, preventing erosion and seed washout, controlling weedy species, and protecting seeds from wildlife consumption. See Figure 41-2.A for appropriate applications.

Treatment	Recommended Use	Flow Velocity for Ditch (ft/sec)	Max. Slope Gradient (V:H)	Approx. C Factor[1] at Max. Grade	Approx. Max. Shear Stress (lbs/sq ft)
Sod	Stabilizing slopes, shallow channels, exposed soil	2 - 7 (0.6-2.1 m/s)	1:4	0.01	1.0 - 3.0 (47.8-143.6 Pa)
Straw Mulch (Method 1)	Stabilizing flat areas	N/A	1:10	0.90	N/A
Stabilized Straw Mulch (Method 2)	Stabilizing slopes and exposed soil	N/A	1:4	0.25	N/A
Hydraulic Mulch (Method 3)	Stabilizing slopes and exposed soil	N/A	1:3	0.25	N/A
Compost w/ Stabilizer (Method 4)	Stabilizing slopes and exposed soil	N/A	1:4	0.25	N/A
ECB	Stabilizing slopes, channels, exposed soil	2 - 7 (0.6-2.1 m/s)	1:3	0.15	1.5 (71.8 Pa)
Heavy Duty ECB	Stabilization of slopes, mulches, and areas to be vegetated; suitable for low flow channel stabilization and steeper slopes	2 - 7 (0.6-2.1 m/s)	1:2	0.25	2.25 (107.7 Pa)
TRM	Long term stabilization and reinforcement of vegetation, especially in highly erosive, hydraulic conditions	7 - 22 (2.1-6.7 m/s)	1:3 or steeper	Varies	10.0 (478.8 Pa)
Hard Armament	Where other practices are inadequate, and for highly erosive, concentrated flows or steep slopes	22+ (6.7+ m/s)	1:2 or steeper	Varies	12.0+ (574.6+ Pa)

[1] *C Factor = ratio of soil loss from protected slope to ratio of soil loss from unprotected slope in large-scale testing, per ECTC and ASTM Standards. Used to compare the effects of different soil management techniques on erosion.*

[2] *Adapted from ECTC* Standard Specifications for Rolled Erosion Control Products.

SUMMARY OF DITCH LINING AND SLOPE TREATMENTS[2]

Figure 41-2.A

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41-2.02(a) Straw Mulch (Mulch Methods 1 and 2)

1. Definition and Purpose. Application of straw fibers to exposed soil as a protective, insulating layer. Straw mulch stabilizes exposed soil and slopes from erosive forces (e.g., wind, water), promotes retention of soil moisture, and encourages the establishment of vegetation.

2. Applications. Consider the following for straw mulch applications:

   - appropriate for disturbed areas that require temporary protection until permanent stabilization is achieved;
   - on slopes 1V:10H and flatter, appropriate with straw mulch alone;
   - on slopes 1V:4H and flatter, appropriate with stabilized straw mulch;
   - not for use in areas of concentrated flow; and
   - in combination with seeding strategies; see Section 41-2.01(b).

3. Design Considerations.

   - Straw mulch may be used for immediate stabilization (unlike hydraulic mulch that requires a drying time).
   - The use of straw mulch may be limited by seasonal availability.
   - The potential exists for introduction of unwanted species.
   - If using a straw blower, disturbed areas should be accessible to vehicles and spreading equipment.
   - If wind or displacement by traffic is a potential problem, straw mulch will need to be anchored; see Mulch Method 2 in Section 251 of the *Standard Specifications*.
   - Straw mulches are biodegradable and should be replaced if decomposition has compromised the stabilizing properties of the product.

4. Specifications. See Section 251 of the *Standard Specifications*.

41-2.02(b) Hydraulic Mulch (Mulch Method 3)

1. Definition and Purpose. Application of degradable fibers or hydraulic matrix combined with a stabilizing tackifier. Hydraulic mulches insulate exposed soils and slopes from erosive forces (e.g., wind, water), promote retention of soil moisture, and encourage establishment of vegetation.

2. Applications. Consider the following for hydraulic mulch applications:

   - appropriate for disturbed areas that require temporary protection until permanent stabilization is achieved;
   - appropriate for areas where there will be re-disturbance following an extended period of inactivity;
   - appropriate for areas where straw mulch is ineffective due to wind, slopes, or ground surface;
   - appropriate for low traffic areas;
   - not appropriate for slopes steeper than 1V:3H; and
   - not to be applied to frozen ground.

3. Design Considerations.

   - Hydraulic mulch typically requires 12 to 24 hours to dry before product is effective, so other erosion control practices (e.g., straw mulch, erosion control blankets, turf reinforcement mats) should be implemented when immediate stabilization is required.
   - A second application may be required in order to remain effective for an entire season, so additional quantities may need to be included in plans.

4. Specifications. See Section 251 of the *Standard Specifications*.

41-2.02(c) Compost Combined With Binder/Stabilizer (Mulch Method 4)

1. Definition and Purpose. Application of compost combined with a performance additive designed to bind/stabilize the compost and prevent erosion of soil during turf establishment.

2. Applications. Consider the following for compost combined with binder/stabilizer applications:

   - appropriate for disturbed areas that require temporary protection until permanent stabilization is achieved,
   - appropriate for areas where there will be re-disturbance following an extended period of inactivity,
   - appropriate for areas where vegetative establishment may be hindered by hard ground surface or poor soil nutrient content,

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- not appropriate for slopes steeper than 1V:4H (see Section 41-2.02), and
- do not use in areas of concentrated flow.

3. Design Considerations. Where practical, track (compact) perpendicular to contours on the slope using a bulldozer before applying compost combined with binder/stabilizer.

4. Specifications. See Section 251 of the *Standard Specifications*.

41-2.02(d) Erosion Control Blankets and Turf Reinforcement Mats

Erosion Control Blankets (ECB) and Turf Reinforcement Mats (TRM) are manufactured BMPs consisting of nets and textiles. These products provide effective and immediate stabilization of slopes and channels before, during, and after the establishment of vegetation. ECBs and TRMs enhance the development of vegetation and TRMs provide for permanent reinforcement.

1. Definition and Purpose. The placement of ECBs and TRMs stabilize disturbed soil and protect from wind and water erosion. The purpose of this practice is to protect the soil surface from raindrop impacts and overland flow during the establishment of grass or other vegetation and to reduce soil moisture loss due to evaporation.

2. Applications. ECBs and TRMs are appropriate for the following applications:

- generally used on steep slopes (e.g., 1V:3H and steeper) or soils with a high erosion hazard rating, as determined by USDA Soil Survey;
- areas inaccessible to other BMPs;
- channels to be vegetated;
- slopes and shorelines adjacent to waterways or environmentally sensitive areas;
- adjacent to shoulders where traffic may blow away other mulches; and
- areas free from large rocks that could damage or affect the performance of the product.

3. Design Considerations.

- ECBs and TRMs provide immediate stabilization of disturbed soil regardless of temperature and precipitation, unlike other erosion control practices that require an ideal temperature or curing time in order to become effective (e.g., hydraulic mulches, soil binders).
- Blankets and mats are generally not suitable for excessively rocky sites.

- When used adjacent to shoulders, the blanket should extend through the ditch line or 25 ft (7.5 m) from the edge of pavement, whichever is greater, in order to mitigate blowing conditions caused by traffic.

- ECBs are biodegradable and should be replaced if decomposition has compromised the stabilizing properties of the product.

- Unlike ECBs designed to biodegrade, some TRMs may be considered semi-permanent or permanent and, therefore, may be implemented in situations requiring long-term stabilization (e.g., longer than one growing season).

- See Figure 41-2.A to determine the proper ECB or TRM to be used.

4. Specifications. See Section 251 of the *Standard Specifications*.

41-2.03 Soil Binders (Stabilization Polymers)

Soil binders consist of spray-on chemical soil amendments designed to provide temporary soil stabilization in low-traffic areas. Some soil binders may be incorporated into the soil medium after their effective use has expired, so they are useful in short-term situations where further disturbance will soon occur (e.g., on stockpiles or areas soon to be graded/paved). Soil binders are composed of chemical blends that penetrate the topsoil and bind the soil particles together, thereby, minimizing wind and runoff erosion. They are used to stabilize the soil and as an erosion control agent. See Figure 41-2.B for appropriate applications.

Attributes	Plant Material Based (Short Lived)	Plant Material Based (Long Lived)	Polymeric Emulsion Blends	Cementitious-Based Binders
Resistance to Leaching	High	High	Low to Moderate	Moderate
Resistance to Abrasion	Moderate	Low	Moderate to High	Moderate to High
Compatibility with Existing Vegetation	Good	Poor	Poor	Poor
Mode of Degradation	Biodegradable	Biodegradable	Photodegradable/ Chemically Degradable	Photodegradable/ Chemically Degradable
Liquid/Powder	Powder	Liquid	Liquid/Powder	Powder

Adapted from California Department of Transportation BMP Handbook.

PROPERTIES OF SOIL BINDERS FOR EROSION CONTROL

Figure 41-2.B

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1. Definition and Purpose. Water soluble polyacrylamide (PAM) or other comparable compounds that are applied to exposed soils. Soil binders provide temporary protection from wind and water erosion in low traffic areas.

2. Applications. Consider the following for soil binders applications:

   - appropriate for areas requiring short-term temporary stabilization;
   - appropriate for areas where grading activities will soon resume;
   - appropriate for temporary stabilization of cut and fill areas and on stockpiles;
   - appropriate for tacking wood fiber or straw;
   - appropriate for where over-spray onto the traveled way, sidewalks, lined drainage channels, and existing vegetation can be avoided;
   - where appropriate, in areas supporting existing vegetation (review product specifications for compatibility);
   - appropriate for soils made up primarily of fine silts, clay, and colloids;
   - not suitable for areas receiving concentrated flow;
   - not suitable for frozen soil conditions or when surface ice is present;
   - not suitable for slopes greater than 1V:3H as a stand-alone practice; and
   - not suitable for areas with pedestrian or vehicular traffic.

3. Design Considerations.

   - Soil binders may require a curing time of up to 24 hours, so other erosion control practices (e.g., straw mulch, ECBs, TRMs) should be implemented when immediate stabilization is required.
   - Because cationic PAM is toxic to aquatic life, only anionic PAM may be used.
   - Stabilization effectiveness increases if PAM is combined with the application of seed and mulch.
   - Soil binders are temporary in nature and may need reapplication. Reapplication is considered maintenance and should be included as a special provision.
   - Some soil binders may not perform well with low relative humidity or in low temperatures. Refer to manufacturer's suggested optimal ambient conditions.
   - Under rainy conditions, some agents may become slippery or leach out of the soil.

- Soil binders do not have the capabilities of organic mulches to insulate the soil or retain soil moisture; see Section 41-2.02(d).

4. Specifications.

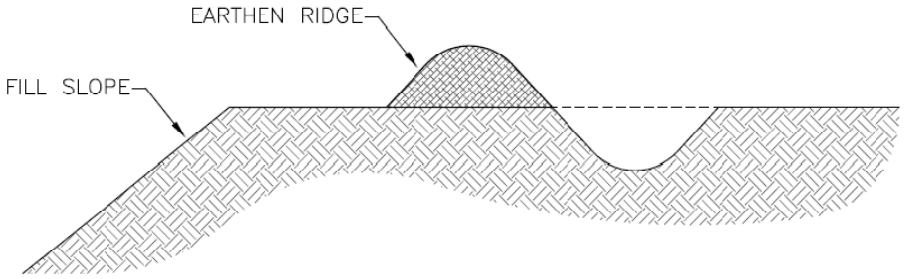
- District Special Provision will be required.
- Refer to manufacturer's specification for particular product.

41-2.04 Concentrated Flow Controls

Concentrated flow control BMPs prevent erosion by redirecting potentially erosive flows along a stabilized path and away from areas that have not yet been stabilized.

41-2.04(a) Diversion Dikes, Drainage Swales, and Lined Ditches

1. Definition and Purpose. Temporary berm of compacted soil with an excavated channel at the upstream toe or temporary drainage ditches (e.g., vegetated, reinforced). Diversion dikes, drainage swales, and lined ditches are designed to divert and convey clean or sediment laden water from upstream tributary areas away from construction activities and exposed soil; see Figure 41-2.C.



DIVERSION DIKE AND DRAINAGE SWALE

Figure 41-2.C

2. Applications. Diversion dikes, drainage swales, and lined ditches are appropriate for the following applications:

- upslope of disturbed areas (including cut or fill slopes) to prevent surface runoff from entering,

- across slopes to reduce slope length,

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- on the down slope side of a construction site to prevent sediment-laden runoff from leaving the site by diverting it to sediment trapping facilities and stabilized outlets, and

- to intercept runoff from paved surfaces.

3. Design Considerations.

- Acquisition of additional right-of-way for diversions may be necessary and may require more time and additional permits.

- Ensure that concentrated flow controls do not become barriers to the movement of construction equipment.

- Design all concentrated flow controls to safely convey the 10-yr, 24-hr storm event.

- Ensure diverted runoff from undisturbed areas is conveyed and discharged to undisturbed areas at non-erosive velocities.

- The minimum height of diversion dikes and berms should be twice the height of the outlet pipe diameter.

- Ensure concentrated flow controls are stabilized prior to use to prevent erosion of exposed soils; see Sections 41-2.02(d) and 41-2.02.

- Consider the additional earthwork costs to remove berms at the end of the project when designing concentrated flow controls.

- Concentrated flow controls are not suitable as sediment-trapping devices.

- It may be necessary to use other soil stabilization and sediment controls in conjunction to prevent scour (e.g., temporary ditch checks); see Section 41-3.03.

- Controls should be constructed of soils that are not easily eroded.

- All ditch, swale, and diversion outlets should be sufficiently stabilized; see Sections 41-2.03(b) and 41-2.05(a).

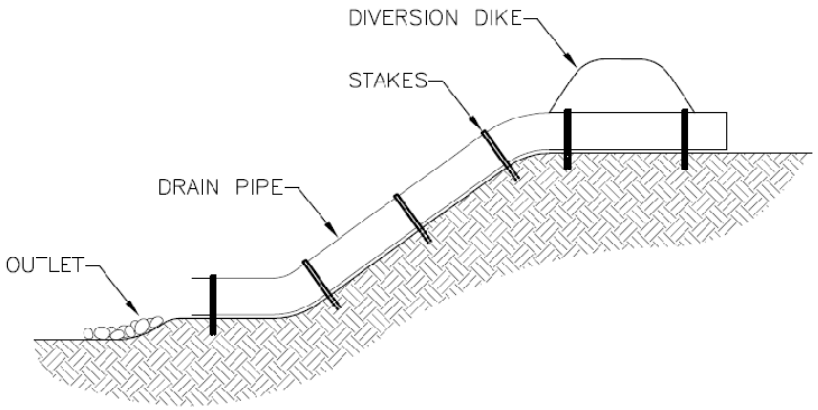
4. Specifications.

- District Special Provision will be required.
- See ISTHA Standard Drawing K1.

Note: Use IDOT pay items when incorporating ISTHA Standards.

41-2.04(b) Slope Drains

1. Definition and Purpose. A flexible tubing or rigid pipe, generally used in conjunction with a diversion dike or channel, to convey concentrated runoff down the face of a cut or fill slope without causing erosion on or at the base of the slope; see Figure 41-2.D.



SLOPE DRAIN

Figure 41-2.D

2. Applications. Slope drains are appropriate for the following applications:

   - where concentrated flow of surface water must be conveyed down a slope without erosion,
   - where runoff is intercepted upstream of a newly graded cut or fill section that has not achieved permanent stabilization, and
   - as an emergency spillway for a sedimentation basin.

3. Design Considerations.

   - The maximum allowable drainage area is 1.5 acres (0.61 ha) per 18 in (457 mm) slope drain. Ensure pipe sizes are adequate to convey flows from upstream tributary area without overtopping impoundment structures (e.g., diversion dikes, silt fence).
   - The maximum slope of slope drains is generally limited to 1V:2H, as energy dissipation below steeper slopes is difficult.
   - For areas larger than 1.5 acres (0.61 ha) or slopes steeper than 1V:2H, it may be necessary to use aggregate-lined channels or additional drains. See Section 283 of the *Standard Specifications*.
   - Severe erosion may result if slope drain fails.

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- Install reinforced stakes and cables at least every 10 ft (3 m) to secure conduit.
- To prevent stress and failure, install drains perpendicular to slope contours.
- Place slope drains on compacted soil that is covered with Class B geotextile filter fabric.
- Slopes drains should always drain directly, or indirectly to sediment traps or sedimentation basins; see Section 41-3.04.
- Protect the area around inlet with appropriate inlet sediment controls and outlet area with velocity dissipater; see Sections 41-3.02 and 41-2.05(a).

4. Specifications.

- District Special Provision will be required.
- See ISTHA Standard Drawing K1.

Note: Use IDOT pay items when incorporating ISTHA Standards.

41-2.05 Outlet Protection Controls

Outlet protection controls prevent erosion by slowing the velocity of concentrated flows. These measures are to be employed wherever concentrated flows are conveyed at erosive velocities (e.g., in steep swales, at pipe outlets). See Figures 41-2.E and 41-2.F.

41-2.05(a) Velocity Dissipaters

1. Definition and Purpose. An area or apron of rock, concrete rubble, or gabions placed at the outlet of a drainage system, intended to prevent erosion and reduce velocity of the storm water outflow.

2. Applications. Use velocity dissipaters where the discharge velocity and energy at an outlet will cause erosion to the receiving channel or area, including:

- outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, and channels (concentrated flows);
- outlets carrying a continuous flow of water;
- outlets subject to short, intense flows;
- outlets to sedimentation basins; and
- points where lined channels discharge to unlined channels or natural waterways.

IDOT Gradation	Maximum Rock Size (lb)*	Equivalent Diameter (spherical) (in) *	Minimum Bedding Thickness (in)	Minimum Thickness (in)
RR-3	50 (22.5 kg)	10 (300 mm)	—	8 (200 mm)
RR-4	150 (67.5 kg)	15 (400 mm)	6 (150 mm)	16 (400 mm)
RR-5	400 (180 kg)	21 (500 mm)	8 (200 mm)	22 (600 mm)
RR-6	600 (270 kg)	24 (600 mm)	10 (250 mm)	26 (700 mm)
RR-7	1000 (450 kg)	28 (700 mm)	12 (300 mm)	30 (800 mm)

* *Assumes a minimum specific gravity of 2.450 and minimum unit weight of 153 lb/ft^3 (2,450 kg/m^3).*

ROCK RIPRAP SIZE AND THICKNESS

Figure 41-2.E

Culvert Diameter (in)	Minimum Tailwater				Maximum Tailwater			
	Max Conduit Velocity = 5 fps (1.5 mps)		Max Conduit Velocity = 10 fps (3.1 mps)		Max Conduit Velocity = 5 fps (1.5 mps)		Max Conduit Velocity = 10 fps (3.1 mps)	
	IDOT Gradation	Apron Length (ft)	IDOT Gradation	Apron Length (ft)	IDOT Gradation	Apron Length (ft)	IDOT Gradation	Apron Length (ft)
12 (0.3 m)	RR-3	10 (3.1 m)	RR-3	12 (3.7 m)	RR-3	12 (3.7 m)	RR-3	15 (4.6 m)
18 (0.5 m)	RR-3	14 (4.3 m)	RR-4	16 (4.9 m)	RR-3	12 (3.7 m)	RR-3	16 (4.9 m)
24 (0.6 m)	RR-3	16 (4.9 m)	RR-4	20 (6.1 m)	RR-3	14 (4.3 m)	RR-4	17 (5.2 m)
30 (0.8 m)	RR-3	18 (5.5 m)	RR-4	22 (6.7 m)	RR-3	16 (4.9 m)	RR-4	20 (6.1 m)
36 (0.9 m)	RR-4	20 (6.1 m)	RR-5	24 (7.3 m)	RR-3	16 (4.9 m)	RR-4	22 (6.7 m)
48 (1.2 m)	RR-4	24 (7.3 m)	RR-6	28 (8.5 m)	RR-4	20 (6.1 m)	RR-4	24 (7.3 m)
60 (1.5 m)	RR-5	32 (9.8 m)	RR-6	36 (10.9 m)	RR-4	22 (6.7 m)	RR-5	26 (7.9 m)
72 (1.8 m)	RR-6	40 (12.2 m)	RR-6	44 (13.4 m)	RR-5	24 (7.3 m)	RR-5	29 (8.8 m)
96 (2.4 m)	RR-7	50 (15.2 m)	RR-7	54 (16.5 m)	RR-5	26 (7.9 m)	RR-5	32 (9.8 m)

Notes:

1. *If tailwater depth from the pipe invert is less than half of diameter of the pipe, then minimum tailwater conditions exist. Otherwise, maximum tailwater conditions exist.*
2. *Adapted from the* Illinois Urban Manual.

MINIMUM IDOT ROCK SIZES AND APRON LENGTH FOR MAXIMUM AND MINIMUM TAILWATER CONDITIONS

Figure 41-2.F

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3. Design Considerations.

- Velocity dissipaters are not adequate to stabilize discharges occurring at the top of a cut or a slope steeper than 1V:10H; see Section 41-2.04.
- Large storms may wash away rock or concrete, leaving the area susceptible to erosion.
- Consider using a riprap-stilling basin or plunge pool where velocities exceed 10 fps (3 mps) or where the velocity requires an apron of an excessive length.
- Riprap, gabions, or slope mattresses placed over filter fabric are the general materials used to provide temporary outlet protection. See Figure 41-2.C.

4. Specifications. See Sections 281 and 284 of the *Standard Specifications*.

41-2.06 Erosion Control Reference Table

Figure 41-2.G references all ECPs discussed in Section 41-2. This figure may be used by the designer as a supplemental tool to ensure that all BMP options have been considered. Note that multiple BMPs may be required from each category in order to provide comprehensive stabilization of the site.

ECP Category	Specific ECP	Appropriate Application	Section
Vegetation	Incorporate Existing Vegetation	Wherever feasible	41-2.01(a)
	Establish New Vegetation	All projects where temporary or permanent stabilization is required; when existing vegetation is removed	41-2.01(b)
Mulch, ECBs and TRMs	Straw, Hydraulic, and Compost Mulches	Temporary stabilization; concurrent with seeding or turf establishment	41-2.02
	ECBs and TRMs	Stabilization of slopes, mulches, and areas to be vegetated; suitable for channel stabilization	41-2.02(d)
Soil Binders	Plant-Material Based, Polymeric Emulsion Blends, and Cementitious-Based Binders	Short- to long-term stabilization of low traffic areas (cut/fill areas, stockpiles, areas to be graded soon)	41-2.03
Concentrated Flow Controls	Diversion Dikes	Upslope and down slope of disturbed areas and across slopes where runoff must be intercepted	41-2.04(a)
	Drainage Swales	Upslope and down slope of disturbed areas, adjacent to paved areas	41-2.04(a)
	Lined Ditches	Upslope and down slope of disturbed area, across slopes, where erosive conditions may exist	41-2.04(a)
	Slope Drains	Where concentrated flows must be conveyed down an unstable slope	41-2.04(b)
Outlet Protection Controls	Velocity Dissipaters	All outlets and points of discharge, where lined channels drain to unlined channels	41-2.05(a)

EROSION CONTROL PRACTICES REFERENCE TABLE

Figure 41-2.G

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41-3 SEDIMENT CONTROL PRACTICES – CONTAINMENT

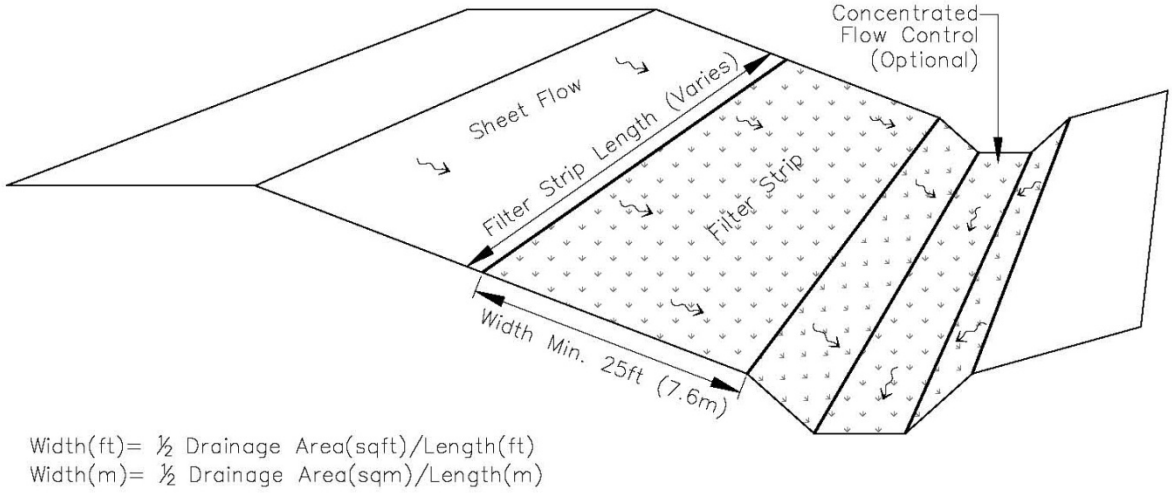
Sediment-laden waters generated on-site should be routed through at least one sediment control practice (SCP) prior to discharge. In some instances, multiple SCPs will be necessary to protect against the discharge of suspended sediment. Install all SCPs in combination with ECPs, using a treatment train approach.

41-3.01 Perimeter Controls

Perimeter control BMPs are methods of containing sediment within the boundaries of the project site. Where containing sediment on site, always install perimeter controls in conjunction with ECPs. Do not use perimeter control as a stand-alone BMPs. Perimeter control BMPs prevent the discharge of sediment by filtering and dissipating the energy of sediment laden sheet flow runoff. Consider all site characteristics when selecting appropriate perimeter control BMPs.

41-3.01(a) Perimeter Vegetated Buffers

1. Definition and Purpose. An existing or proposed area of vegetation designed to remove sediment and other pollutants and enhance infiltration of surface runoff. See Figure 41-3.A.



VEGETATION BUFFERS

Figure 41-3.A

2. Applications. Preservation of existing vegetated buffers should always be considered. Perimeter vegetated buffers are appropriate for the following applications:

- projects where grading can be phased and vegetation can be temporarily preserved and used for sediment control;
- urban areas where surface runoff is discharged as sheet flow;
- adjacent to roadways, parking lots, and other impervious surfaces to filter runoff before discharge to storm sewers, swales, and waterways; and
- areas where upstream tributary sheet flow enters site.

3. Design Considerations.

- Vegetation selection varies depending on climate, soil type, topography, land use, available light (e.g., shade tolerance), aesthetics, and planned use of the area.
- The maximum drainage area to a vegetated buffer should be 5 acres (2 ha).
- Vegetated buffer slope should be 1V:6H or flatter if used as a stand-alone perimeter control.
- The width (e.g., dimension parallel to flow path) of the vegetated buffer can be calculated using the equation:

  Width (ft (m)) = Half of the Drainage Area to Buffer ÷ Buffer Length*

  * *Buffer length is the dimension perpendicular to the flow path.*

- The minimum width (e.g., dimension parallel to flow) should be 25 ft (7.62 m).
- Vegetation should be established prior to runoff being directed onto it from impervious areas. If this is not possible, install sodding in the buffer area.
- Avoid concentrated flows through the vegetated buffer. If potential exists for concentrated flows, employ other sediment control measures upstream of the buffer.
- Locate protection measures at the boundary of the existing or proposed vegetated buffer area or 1 ft (300 mm) outside the perimeter of the leaf canopy if a stand of trees is to be protected.
- Install all required protection measures prior to the commencement of any site development activity. Protective measures should remain in place year round and in working, functional order until all site development activities have ceased or the surrounding area has been stabilized.

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- Prohibit construction activities, heavy equipment, vehicular traffic, or storage of construction materials within the vegetated buffer area.

4. Specifications.

- See Sections 250, 252, and 280 of the *Standard Specifications*.

- Where existing vegetation is used, delineate the area as a "No Intrusion Area" on the ESCP sheets and note the area in the SWPPP. Temporary fencing and/or signage can be used to delineate this BMP.

- Where proposed vegetation is to be used, note the timing of the installation in the SWPPP. A schedule will be required to designate the widths of vegetation to be used as a buffer.

- See *Illinois Urban Manual* STD 835 (Filter Strip).

- See *Illinois Urban Manual* STD IL-535.

Note: Use IDOT pay items when incorporating Illinois Urban Manual Standards.

41-3.01(b) Perimeter Silt Fence Barriers

1. Definition and Purpose. A temporary permeable barrier of entrenched filter fabric used to contain sediment within a site. Perimeter silt fence barriers promote sedimentation of sheet-flow runoff prior to discharge from the construction site. They intercept and detain small amounts of sediment resulting from disturbed areas (e.g., construction sites) and prevent sediment from leaving the site.

2. Applications. Perimeter silt fence barriers are appropriate for the following locations:

- along the perimeter of a project,
- around temporary soil stockpiles and spoil areas,
- along perimeter of streams and channels,
- downslope of exposed erodible soil areas, and
- below the toe of exposed and erodible slopes.

3. Design Considerations.

- Do not install silt fence barriers in areas of concentrated flow (e.g., streams, channels, drain inlets).

- Do not use silt fence barriers as mid-slope protection on slopes steeper than 1V:4H; see Section 41-3.03.

- Do not install silt fence barriers where ponding water behind the silt fence may cause flooding or fence failure.

- Silt fence barriers should not make dips that intercept slope contours because flows will be concentrated and blowouts may occur.

- The maximum drainage area for sheet-flow runoff to a silt fence should not exceed 0.5 acre per 100 ft (0.2 ha per 30 m) of fence.

- Install silt fence barriers with a "J"-Hook at intervals of at least 200 ft (61 m).

4. Specifications.

   - See Section 280 of the *Standard Specifications*.
   - See IDOT Highway Standard 280001.

   Note: Contractor will have choice of materials unless a District Special Provision is included.

41-3.01(c) Perimeter Straw Bale Barriers

1. Definition and Purpose. A temporary barrier of entrenched and anchored straw bales used to contain sediment within a site. Perimeter straw bale barriers promote sedimentation of sheet-flow runoff prior to discharge from a construction site.

2. Applications. Perimeter straw bale barriers are appropriate for the following locations:

   - along the perimeter of a project,
   - around temporary soil stockpiles and spoil areas,
   - down-slope of exposed erodible soil areas, and
   - below the toe of exposed and erodible slopes.

3. Design Considerations.

   - Do not install straw bale barriers in areas of concentrated flow (e.g., streams, channels).

   - This control can only be used for installations less than three months, because straw bales tend to rapidly degrade.

   - Straw bales can introduce non-native, undesirable plants.

   - The maximum drainage area for sheet-flow runoff to a straw bale barrier should not exceed 0.5 acre per 100 ft (0.1 ha per 30 m) of barrier.

4. Specifications.

   - See Section 280 of the *Standard Specifications*.
   - See IDOT Highway Standard 280001.

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Note: Contractor will have choice of materials unless a District Special Provision is included.

41-3.01(d) Perimeter Rolled Barriers

1. Definition and Purpose. Rolled and bound wood excelsior or equivalent placed around the site perimeter or stockpiles. Rolled barriers decrease the velocity and erosive force of sheet flows, and contain sediment by detaining and filtering runoff.

2. Applications. Perimeter rolled barriers are appropriate for the following locations:

   - along the perimeter of a project;
   - around temporary stockpiles and spoil areas;
   - at the top, face, and toe of erodible and exposed slopes;
   - at grade breaks on erodible and exposed slopes; and
   - down slope of any exposed soil areas.

3. Design Considerations. Install rolled excelsior barriers at the same elevation (e.g., along the same contour line) to prevent erosion.

4. Specifications.

   - See Section 280 of the *Standard Specifications*.
   - See ISTHA Standard Drawing K1.

   Note: Contractor will have choice of materials unless a District Special Provision is included.

41-3.02 Inlet Controls

Inlet controls prevent the movement of sediment and other pollutants into the storm sewer network. Consider all site and storm sewer characteristics when selecting an appropriate BMP. Sheet flow draining to drop inlets and shallow concentrated flow draining to culvert inlets require different methods of treatment, so it is important to select a BMP best suited to accommodate the expected velocity, shear stress, and sediment load of site runoff.

41-3.02(a) Drop Inlet Filter Bags

1. Definition and Purpose. A manufactured inlet filtration bag that is custom-fitted for insertion under virtually any type of drop drainage structure casting. An inlet filter can significantly reduce the ingress of sediment into the storm sewer system.

2. Applications. Drop inlet filter bags are appropriate for the following locations:

- inlets within paved areas, and
- drop inlets receiving runoff from 0.5 acre (0.2 ha) or less.

3. Design Considerations. Common curb-and-gutter and parking lot installations are available. The designer should ensure availability before specifying in other locations.

4. Specifications. See Section 280 of the *Standard Specifications*.

41-3.02(b) Drop Inlet Silt Fence Barriers

1. Definition and Purpose. A temporary silt fence secured around a drop inlet. Silt fence barriers impound water behind the barrier allowing sediment to drop out before the water enters the inlet.

2. Applications. Drop inlet silt fence barriers are appropriate for the following applications:

   - only for drop inlets in unpaved areas where the base of barrier can be trenched; and
   - for relatively small, flat areas (e.g., less than 1 acre (0.4 ha) per inlet; flatter than 5% slopes) with shallow sheet flows not exceeding 1 cfs (0.03 cms).

3. Design Considerations.

   - Slopes immediately surrounding silt fence barrier should not exceed 1% and must remain accessible for removal of accumulated sediment.
   - Verify flooding will not impact surrounding land.

4. Specifications.

   - See Section 280 of the *Standard Specifications*.
   - See IDOT Highway Standard 280001.

   Note: Contractor will have choice of materials unless a District Special Provision is included.

41-3.02(c) Drop Inlet Straw Bale Barriers

1. Definition and Purpose. A sediment control barrier consisting of entrenched and staked straw bales surrounding a drop inlet. Straw bale barriers impound water behind the barrier allowing sediment to drop out before the water enters the inlet.

2. Applications. Drop inlet straw bale barriers are appropriate for the following applications:

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- only for drop inlets in unpaved areas; and
- in relatively small, flat areas (e.g., less than one acre per inlet; flatter than 5% slopes) with shallow sheet flows not exceeding 0.5 cfs (0.01 cms).

3. Design Considerations.

- Straw bale barriers are effective for three months or less.
- Slopes immediately surrounding straw bale barrier should not exceed 1% and must remain accessible for removal of accumulated sediment.
- Straw bales can introduce non-native, undesirable plants.

4. Specifications.

- See Section 280 of the *Standard Specifications*.
- See IDOT Highway Standard 280001.

Note: Contractor will have choice of materials unless a District Special Provision is included.

41-3.02(d) Drop Inlet Rolled Barriers

1. Definition and Purpose. Rolled and bound wood excelsior or equivalent surrounding a drop inlet. Rolled barriers impound water behind the barrier allowing sediment to drop out before the water enters the inlet.

2. Applications. Drop inlet rolled barriers are appropriate for the following applications:

- around drop inlets in unpaved areas, especially where other inlet controls are not feasible; and
- in relatively small, flat areas (e.g., less than one acre (0.4 ha) per inlet; flatter than 5% slopes) with shallow sheet flows not exceeding 0.5 cfs (0.01 cms).

3. Design Considerations.

- Rolled barriers should be staked and trenched in to a depth of 3 in (762 mm) to prevent displacement by high flows.
- Slopes immediately surrounding rolled barrier should not exceed 1% and must remain accessible for removal of accumulated sediment.

4. Specifications.

- District Special Provision will be required.
- See ISTHA Standard Drawing K1.

Note: Use IDOT pay items when incorporating ISTHA Standards.

41-3.02(e) Drop Inlet Prefabricated Barriers

1. Definition and Purpose. Manufactured, temporary sediment control barriers constructed of geosynthetic fabric and foam or equivalent. Drop inlet prefabricated barriers are installed around drop inlets in order to intercept and pond sediment-laden runoff prior to entering the storm sewer. Ponding the water reduces the velocity of any incoming flow and allows most of the suspended sediment to settle and be intercepted. After the water height reaches the top of the barrier, it flows over the dike and into the inlet.

2. Applications. Drop inlet prefabricated barriers are appropriate for the following applications:

- in relatively small, flat areas (e.g., less than one acre (0.4 ha) per inlet; flatter than 5% slopes) with shallow sheet flows not exceeding 0.5 cfs (0.01 cms); and
- where temporary upstream ponding will not adversely affect roadways or construction.

3. Design Considerations

- Slopes immediately surrounding prefabricated barrier should not exceed 1% and must remain accessible for removal of accumulated sediment.
- Place prefabricated barriers directly around the perimeter of the inlet.
- Place two full sections against opposite sides of the inlet, and extend both sections beyond the drop sides of the inlet.
- Where multiple barriers are installed, the sleeve end of fabrics should overlap at the joints and ends and be stapled to prevent bypass of storm water.
- Prefabricated barriers can be cleaned, moved, and reused multiple times.

4. Specifications. District Special Provision required.

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41-3.02(f) Above Grade Drop Inlet Filters

1. Definition and Purpose. Filter fabric-covered, polyethylene-framed barriers that are installed over area drains. Above grade inlet filters protect storm drains from ingress of sediment during construction activities.

2. Applications. Above grade drop inlet filters are appropriate for the following applications:

   - only for drop inlets in sump conditions;
   - for relatively small, flat areas (e.g., one acre (0.4 ha) or less) draining to each inlet; and
   - where sediment laden water is capable of clogging conventional inlet filters.

3. Design Considerations. None.

4. Specifications. See BDE Special Provision for "Above Grade Inlet Filter" (to be incorporated into Section 280 of *Standard Specifications* at a later date).

41-3.02(g) Pipe (Culvert) Inlet Vegetated Buffers

1. Definition and Purpose. A preserved or created area of vegetation at a culvert inlet that filters runoff prior to drainage. A vegetated buffer helps prevent sediment, mulch, and other pollutants from entering the storm sewer system before permanent seeding has become established in the tributary area of the storm inlet.

2. Applications. Pipe (culvert) inlet vegetated buffers are appropriate for the following applications:

   - in areas surrounding pipe inlets, especially culverts; and
   - in conjunction with other SCPs; see Section 41-3.04.

3. Design Considerations.

   - Ensure all feasible efforts are used to preserve existing vegetative buffers during construction.
   - See Section 41-3.01(a) for sizing of vegetated buffers. The minimum length is 25 ft (7.62 m).
   - Designate vegetative buffers as no entry areas by use of signage and/or temporary fence.
   - If removal of existing vegetation cannot be avoided, sod may be used as a buffer. Place the sod level with the surrounding ground surface and extend it at least 25 ft (7.62 m) from inlet.

4. Specifications.

   - See Sections 250, 252, and 280 of the *Standard Specifications*.
   - Where existing vegetation is used, delineate the area as a "No Intrusion Area" on the ESCP sheets. Also, note this area in the SWPPP. Temporary fencing and/or signage can be used to delineate this BMP.
   - Where proposed vegetation is used, note the timing of the installation in the SWPPP. Include a schedule to designate the widths of vegetation to be used as a buffer.
   - See *Illinois Urban Manual* practice STD 862 (Inlet Protection-Sod Filter).
   - See *Illinois Urban Manual* STD IL-562.

   Note: Use IDOT pay items when incorporating Illinois Urban Manual Standards.

41-3.02(h) Pipe (Culvert) Inlet Silt Fence Barriers

1. Definition and Purpose. A temporary permeable barrier of entrenched filter fabric used to protect a pipe inlet. A pipe (culvert) inlet silt fence barrier promotes the deposition of sediment from sediment-laden runoff prior to discharge from the construction site.

2. Applications. Use a pipe (culvert) inlet silt fence barrier for sediment control around pipe and culvert inlets where other methods of inlet protection and sediment control cannot be implemented in a timely manner. See Sections 41-3-.02(g), 41-3.03, and 41-3.04.

3. Design Considerations. Filter fabric may cause storm water backup and flooding of adjacent areas.

4. Specifications.

   - See Section 280 of the *Standard Specifications*.
   - See IDOT Highway Standard 280001.

41-3.02(i) Pipe (Culvert) Inlet Straw Bale Barriers

1. Definition and Purpose. A temporary barrier consisting of entrenched straw bales placed at a pipe inlet. Pipe (culvert) inlet straw bale barriers promote sedimentation and filtration of runoff prior to discharge from the construction site.

2. Applications. Use pipe (culvert) inlet straw bale barriers for short term (e.g., less than three months), sediment control around pipe and culvert inlets where other methods of inlet protection and sediment control cannot be implemented in a timely manner. See Sections 41-3-.02(g), 41-3.03, and 41-3.04.

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3. Design Considerations.

- Straw bales may cause storm water backup and flooding of adjacent areas.
- Straw bales decompose and disintegrate rapidly; therefore, may be inefficient and expensive to maintain.
- Straw bales can introduce unwanted plant species and can contribute organic matter to waterways if improperly installed.

4. Specifications. See Section 280 of the *Standard Specifications*.

41-3.03 Temporary Ditch and Slope Checks

41-3.03(a) Aggregate Ditch Checks

1. Definition and Purpose. A small rock barrier constructed perpendicular to the flow path in drainage ditches and swales. Aggregate ditch checks reduce the velocity of surface water, which reduces scouring and allows sedimentation to occur. Ditch checks also promote infiltration where suitable soils are present.

2. Applications. Aggregate ditch checks are appropriate for the following applications:

- most economical choice for steep swales or ditches with velocities exceeding 4.9 ft/s (1.5 m/s),
- during the establishment of grassy-linings in swales or ditches (both temporary and permanent), and
- in temporary swales where erosion control lining is not warranted due to their short service time.

3. Design Considerations.

- Maximum recommended drainage area to each ditch check should not exceed 10 acres (4 ha).
- Maximum spacing between the ditch checks should be such that the toe of the upstream ditch check is at the same elevation as the top of the rock at the center of the downstream ditch check; see Figure 41-3.B.
- If scouring occurs on downstream side of aggregate ditch check, install ECBs, or TRMs to prevent further erosion; see Section 41-2.02.

% Slope	Height at Center/Overflow Pt. of Ditch Check (ft)	Spacing of Ditch Check (ft)
8%	1.0 (0.3 m)	13 (3.9 m)
	1.5 (0.5 m)	20 (6.1 m)
	2.0 (0.6 m)	26 (7.9 m)
7%	1.0 (0.3 m)	14 (4.27 m)
	1.5 (0.5 m)	21 (6.40 m)
	2.0 (0.6 m)	28 (8.5 m)
6%	1.0 (0.3 m)	17 (5.2 m)
	1.5 (0.5 m)	26 (7.9 m)
	2.0 (0.6 m)	34 (10.4 m)
5%	1.0 (0.3 m)	20 (6.1 m)
	1.5 (0.5 m)	30 (9.1 m)
	2.0 (0.6 m)	40 (12.2 m)
4%	1.0 (0.3 m)	25 (7.6 m)
	1.5 (0.5 m)	38 (11.6 m)
	2.0 (0.6 m)	50 (15.2 m)
3%	1.0 (0.3 m)	33 (10.1 m)
	1.5 (0.5 m)	50 (15.2 m)
	2.0 (0.6 m)	66 (20.1 m)
2%	1.0 (0.3 m)	50 (15.2 m)
	1.5 (0.5 m)	75 (22.9 m)
	2.0 (0.6 m)	100 (30.5 m)
1% and below	1.0 (0.3 m)	100 (30.5 m)
	1.5 (0.5 m)	150 (45.7 m)
	2.0 (0.6 m)	200 (60.9 m)

Notes:

1. *For applications not addressed in this figure, spacing should be equal to the height of ditch check divided by the slope. This ensures that the base of the upstream check is at the same elevation as the crest of the downstream check.*

2. *Adapted from the* Illinois Urban Manual.

SPACING OF TEMPORARY DITCH CHECKS

Figure 41-3.B

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- Aggregate ditch checks are not recommended for slopes greater than 20%. When steeper than 20%, stabilize channels and drain to a SCP; see Section 41-2.03(a) and Section 41-3.04.

4. Specifications. See Sections 28 and 283 of the *Standard Specifications*.

41-3.03(b) Prefabricated Ditch Checks

1. Definition and Purpose. Manufactured temporary ditch checks are placed perpendicular to flow in shallow drainage ditches. The purpose of temporary ditch checks is to reduce the velocity of flowing water, thereby, reducing scour and channel erosion, encouraging deposition of sediment and filtration, and promoting infiltration where suitable soils are present.

2. Applications. Prefabricated ditch checks are appropriate for the following applications:

   - in shallow swales or ditches with slopes less than 8%,
   - during establishment of vegetation, and
   - in temporary swales where erosion control lining is not warranted due to short service time.

3. Design Considerations.

   - Product should not cause flooding of adjacent areas or roadways.
   - Place ditch checks perpendicular to the flow path.
   - Space ditch checks according to Figure 41-3.B.

4. Specifications. See Section 280 of the *Standard Specifications*.

41-3.03(c) Rolled Barrier Slope Checks

1. Definition and Purpose. Rolled and bound wood excelsior or equivalent placed on the face of slopes, installed perpendicular to the flow path. Slope checks decrease the velocity and erosive force of sheet flows by reducing slope length and contain sediment near its source by detaining and filtering runoff.

2. Applications. Roller barrier slope checks are appropriate for the following applications:

   - at the top, face, and toe of erodible and exposed slopes;
   - at grade breaks on erodible and exposed slopes;
   - down slope of any exposed soil areas; and
   - not to be used on steep slopes susceptible to slumping or creeping.

3. Design Considerations.

- Rolled barriers should be staked and trenched in to a depth of 3 in (762 mm) to prevent displacement by high flows.

- Space rolled barriers in accordance with the following:

  + slope inclination of 1V:4H or flatter = 20 ft (6.1 m) apart,
  + slope inclination of 1V:4H to 1V:2H = 15 ft (4.6 m) apart, and
  + slope inclination 1V:2H or greater = 10 ft (3.0 m) apart.

- Install temporary slope checks at the same elevation (along the same contour line) to prevent erosion.

4. Specifications.

- District Special Provision will be required.
- See ISTHA Standard Drawing K1.

Note: Use IDOT pay items when incorporating ISTHA Standards.

41-3.04 Sediment Traps and Basins

These sediment controls use excavated or impounded areas to temporarily detain sediment-laden water to promote settling of suspended particles prior to discharge. The outlets of these sediment controls should be stabilized (see Sections 41-2.04 and 41-2.05) so that treated water does not become re-contaminated, and should receive secondary treatment by means of inlet control BMPs (see Section 41-3.02) prior to drainage to a storm sewer. Designs should allow for adequate retention time to ensure maximal sedimentation for the anticipated sediment loads.

41-3.04(a) Sediment Traps

1. Definition and Purpose. A small, temporary ponding area either excavated or impounded by embankments. A sediment trap detains runoff for a sufficient period of time to allow sediment to drop out of suspension prior to discharge through a stabilized spillway. These practices are optimal for draining small disturbed areas comprised of coarse textured soils.

2. Applications. Sediment traps are appropriate for the following applications:

- for removal of medium to large-sized sediment particles (e.g., sands, coarse silts). For finer textured soils (e.g., silts, clays), see Section 41-3.04(b);

- at the outlets of small disturbed soil areas draining less than 5 acres (2 ha). If the contributing drainage area is greater than 5 acres (2 ha), see Section 41-3.04(b);

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- for installations lasting less than 18 months;
- as a supplemental control to provide additional protection for waterways and drainage systems;
- at the perimeter of the site, at the outlet of any runoff conveyance that will discharge sediment-laden water, or along the flow path of runoff being conveyed through the site;
- where failure of the sedimentation trap will not result in injury, loss of life, damage to homes, buildings, roads, or other public infrastructure or service utilities; and
- not in live waterways or streams.

3. Design Considerations.

- Design the sediment trap to provide enough storage to accommodate the settling process (e.g., live storage) in addition to the accumulated sediment (e.g., dead storage).
- Live storage volume should, at a minimum, accommodate 3600 ft^3 of runoff per acre (101.9 m^3 per ha) tributary to each sediment trap.
- Design the dead storage to store the estimated sediment load generated from the site over the duration of the construction period. Ensure it is below the permeable fill.
- Total storage may consist of only live detention storage; however, a more frequent schedule for sediment removal will be required.
- Larger surface areas provide more effective settling than smaller areas.
- Larger length-to-width ratios provide protection against short-circuiting; therefore, the length of the trap should be at least twice the width as measured from inlet to outlet.
- If trap is formed by an embankment, maximum height should not exceed 5 ft (1.5 m).
- Side slopes should be no steeper than 1V:2H and be stabilized with vegetation, ECB, or TRM; see Section 41-2.02.
- Sediment should be removed and trap restored to original dimensions when accumulation reaches ½ the design depth of dead storage. If only live storage is used, then sediment should be removed after each sediment generating storm event.

- For situations where particle size or wind turbulence impedes settling within recommended timeframe, chemical treatment may be considered; see Section 41-3.05(b).

- Multiple traps and/or additional volume may be required to accommodate site-specific rainfall and soil conditions.

- Outlet design should ensure sediment is contained and erosion of outlet does not occur. Outflows should discharge to fully stabilized channels at non-erosive velocities; see Section 41-2.05.

- For outlets with a discharge point onto or cut into natural ground, the outlet width (ft (m)) should be equal to six times the drainage area (acres (ha)). If an embankment is used, the outlet should be at least 1 ft (300 mm) below the top of the embankment.

- For outlets consisting of a coarse aggregate and riprap section, locate the stone at the low point of the trap and extend vertically to 1 ft (300 mm) below the top of the embankment. Place coarse aggregate (CA-3) on the upstream side of outlet, separated by filter fabric from riprap (RR-3) on downstream side of outlet; see Section 41-3.03(a). Outlet width (ft (m)) should be equal to six times the drainage area (acres (ha)).

- Provide a maintenance access-way for sediment removal and disposal.

- Sediment traps require construction safety fencing around perimeter.

4. Specifications.

   - District Special Provision and detailed drawing will be required.

   - See ISTHA Standard Drawing K1.

   - See *Illinois Urban Manual* practice STD 960 (Temporary Sediment Trap).

   - See *Illinois Urban Manual* STD Drawing IL-660 (Temporary Sediment Trap) as a plan sheet.

   Note: Use IDOT pay items when incorporating ISTHA and Illinois Urban Manual Standards.

41-3.04(b) Sediment Basins

1. Definition and Purpose. A temporary ponding basin (i.e., larger than a Sediment Trap), either excavated or impounded by earthen embankments with a controlled release. A sedimentation basin detains runoff for a sufficient period of time to allow sediment to

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drop out of suspension prior to discharge through a control structure. These practices are optimal for draining large disturbed areas comprised of finer textured soils.

2. Applications. Sediment basins are appropriate for the following applications:

- for removal of medium to small sized sediment particles (e.g., silts, clays);
- at the outlets of large disturbed soil areas;
- generally for areas between 5 and 10 acres (2 and 4 ha), but not for drainage areas greater than 75 acres (30 ha);
- at the perimeter of the site, at the outlet of any runoff conveyance that will discharge sediment-laden water, or along the flow path of runoff being conveyed through the site;
- where sediment basins are to remain in place after construction is completed as permanent structures (e.g., for storm water detention purposes);
- where failure of the sedimentation basin will not result in injury, loss of life, damage to homes, buildings, roads, or other public infrastructure, or service utilities; and
- not in live waterways or streams.

3. Design Considerations.

- Design the basin to provide enough storage to accommodate the settling process (live storage) in addition to the accumulated sediment (dead storage).
- Multiple basins and/or additional volume may be required to accommodate site-specific rainfall and soil conditions.
- Design the live storage volume for the runoff from a 2-year, 24-hour storm event draining into the basin under maximum runoff conditions, or 3600 ft^3 of runoff per acre (101.9 m^3 per ha) tributary to the basin, whichever is greater.
- Dead storage should be sized to store the estimated sediment load generated from the site over the duration of the construction period, or 3600 ft^3 of runoff per acre (101.9 m^3 per ha) tributary to the basin, whichever is greater.
- Ensure the dead storage is below the permeable fill.
- Larger surface areas provide more effective settling than smaller areas.
- Larger length-to-width ratios provide protection against short-circuiting; therefore, the length of the basin should be at least twice the width as measured from inlet to outlet.

- Basin should have a minimum depth of 3 ft (900 mm) and a maximum of 5 ft (1.5 m) in order to maximize safety and efficiency.
- Side slopes should be no steeper than 1V:2H and be stabilized with vegetation, ECB, or TRM; see Section 41-2.02.
- Sediment should be removed and basin restored to original dimensions when accumulation reaches ½ the design depth of dead storage.
- Calculate the elevation of sediment cleanout level and clearly mark the level on the riser.
- Sediment clean-out level should never exceed 1 ft (300 mm) below the top of riser.
- For situations where particle size or wind turbulence impedes settling within recommended timeframe, chemical treatment may be considered; see Section 41-3.05.
- Basin sizes may be limited based on available right-of-way.
- In restrictive right-of-way areas, the basin may be designed to store 1800. ft^3 per acre (125 m^3 per hectare) of contributing drainage area.
- Where reduced sized basins will be used, more frequent clean out intervals will be required.
- Design the outlet to drain the basin within 24 to 72 hours in order to provide adequate time for sediment to settle out of suspension and protection against mosquito concerns.
- Recommended outlet types are a single orifice outlet or a perforated riser.
- Outlet should consist of corrugated metal, high-density polyethylene (HDPE) or reinforced concrete riser pipe with dewatering holes.
- Attach an anti-vortex device and trash rack to the top of the riser to prevent the discharge of floatables and to protect outlet from obstruction.
- At the outflow from the sediment basin, install velocity dissipation devices; see Section 41-2.05.
- The design should include features to accommodate overflow or bypass flows that exceed the design storm event.
- The overflow should consist of an open spillway over undisturbed material or properly compacted fill and be appropriately stabilized with vegetation or riprap.

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- The level portion of the spillway at the highest elevation in the channel (control section) should be a minimum of 20 ft (6.1 m) in length.

- Provide a maintenance access-way for sediment removal and disposal.

- The perimeter of the basin requires construction safety fencing.

4. Specifications.

- See Section 280 of the *Standard Specifications*.
- ISTHA Standard Drawing K1 for basin dewatering details.

Note: Use IDOT pay items when incorporating ISTHA Standards.

41-3.05 Flocculent Polymers

41-3.05(a) Batch Treatment

1. Definition and Purpose. The process of applying chemical compounds to sediment-laden bodies of water (e.g., sediment traps, sedimentation basins) to reduce turbidity by causing fine sediments to settle out. The compounds are generally buffered alum, polyacrylamide (PAM), and ferric chloride (or ferrous sulfate), which promote settling of fine, suspended particles through the process of flocculation. Flocculation occurs when small, charged soil particles become attached to the chemical compounds and aggregate into larger masses, which then settle out of suspension.

2. Applications. Batch treatment is appropriate for the following applications:

- where turbid discharges cannot be avoided using other SCPs, see Section 41-3.05; and

- only in conjunction with other sedimentation controls, see Section 41-3.04.

3. Design Considerations.

- Anionic PAM is the most commonly used treatment for flocculation of suspended colloids, clays, and metals. PAM is soil specific and should, therefore, be tested on soils and water from the site to ensure adequate performance.

- Do not use cationic PAM, which is highly toxic to aquatic life.

- Perform toxicity and pH testing to ensure that flocculants meet water quality standards.

- Dilute granular flocculants in water to form stock solutions, which is applied hydraulically to the water surface.

- Flocculation effectiveness is highly dependent on the compound being thoroughly dissolved and mixed with the turbid water.

- In general, application rate should yield 1 ppm in the final volume. The application rate is specific to runoff constituents, site conditions, and flocculent compounds.

4. Specifications.

- District Special Provision will be required.
- Refer to manufacturer's specification for chosen product.

41-3.05(b) Flow-Through Treatment (Flocculent Logs, Polymer Treated Structures)

1. Definition and Purpose. The process of bringing concentrated flows (e.g., diversion channels, dewatering discharges, ditches, swales) of sediment-laden runoff in contact with flocculent-treated materials in order to promote settling of suspended particles; see Section 41-3.05(a).

2. Applications. Flow-through treatments are appropriate for the following applications:

- where turbid discharges cannot be avoided by sole use of other SCPs, see Section 41-3.04;

- turbid discharges associated with dewatering, pipe discharges, channelized or concentrated flow paths, storm sewer conveyance and collection systems, temporary diversions, and bypass channels; and

- only for concentrated flows draining to a sediment trap or sedimentation basin, see Section 41-3.04.

3. Design Considerations.

- Semi-hydrated polymer blocks (e.g., floc logs) may be placed within sediment-laden concentrated flow paths as a "pretreatment" to remove fine, suspended solids (e.g., silts, clays, colloids) prior to discharge to a sediment trap or sediment basin.

- Effluent from flow-through treatments should not drain directly into natural water bodies or storm sewer.

- Anionic PAM is the most commonly used treatment for flocculation of suspended colloids, clays, and metals. PAM is soil specific and should, therefore, be tested on soils and water from the site to ensure adequate performance.

- Do not use cationic PAM, which is highly toxic to aquatic life.

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- Flocculation effectiveness is highly dependent on the compound being thoroughly dissolved and mixed with the turbid water.

- Perform toxicity and pH testing to ensure that flocculants meet water quality standards.

- Securely stake flocculent logs and other polymer-treated structures along the flow path based upon manufacturers' specifications and site characteristics.

4. Specifications.

   - District Special Provision will be required.
   - Refer to manufacturer's specification for chosen product.

41-3.06 Entrance/Exit Controls

Entrance/exit control BMPs prevent the tracking of sediment attached to equipment and vehicles offsite. The design of entrance/exit control measures will depend upon the site conditions. Generally, these BMPs are not a pay item as the contractor is required to install and maintain per NPDES permits. If the district feels the necessity to require this item in a specific location, a District Special Provision will be required.

41-3.06(a) Stabilized Construction Entrance/Exits

1. Definition and Purpose. A stabilized pad of coarse aggregate, underlain with geotextiles or a commercially available prefabricated unit designed to vibrate accumulated sediment from tires and under chassis. BMPs are located at any point where traffic will be entering and leaving a construction site. Stabilized construction entrances and exits reduce or eliminate the tracking of sediment (e.g., mud, dirt) onto public right-of-way or streets by construction vehicles.

2. Applications. At all points of construction ingress/egress where sediment can be tracked onto public roads.

3. Design Considerations.

   - Stabilized construction entrances can be expensive to construct and maintain, so it will be necessary to limit the number of access points to the construction site.

   - Design stabilized entrances and exits for the heaviest vehicles and equipment loads.

   - Construct stabilized entrances and exits on level or slightly sloping ground.

   - Aggregate entrances and exits may require periodic top dressing.

- Route runoff from the entrance through a sediment-trapping device.
- If site conditions are such that the entrance does not remove sufficient amounts of sediment from vehicle and equipment tires, then tire washing may also be required; see Section 41-3.06(b).
- A temporary pipe culvert may be needed beneath the entrance as to not impede ditch or surface flow towards the entrance.

4. Specifications.

- Generally not a pay item as the contractor is required to install and maintain per NPDES permits. If the district feels the necessity to require this item in a specific location, include a District Special Provision.
- See *Illinois Urban Manual* practice STD 930 (Stabilized Construction Entrance).
- See *Illinois Urban Manual* STD Drawing IL-630 (Stabilized Construction Entrance Plan) as a plan sheet.

Note: Use IDOT pay items when incorporating Illinois Urban Manual Standards.

41-3.06(b) Tire Wash Stations

1. Definition and Purpose. A designated area where sediment may be washed from equipment tires and chassis prior to exiting the site via a stabilized construction exit. Sediment is collected in a receptacle and disposed of at an approved location. Tire wash stations reduce or eliminate the tracking of sediment (e.g., mud, dirt) onto public right-of-way or streets by construction vehicles and ensure appropriate discharge of sediment-laden wash water.

2. Applications. Tire wash stations are appropriate for the following applications:

- on sites where conditions are such that a stabilized construction entrance alone does not remove all sediment from vehicle and equipment tires; and
- in combination with grated wash rack (e.g., cattle guard).

3. Design Considerations.

- Wash stations require a supply of wash water.
- Where wash areas are used, provide a construction entrance with two lanes (e.g., to avoid having incoming vehicles drive through the wash area) or have a turnout area.

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- Drain wash water away from the construction entrance and adjacent pavement towards a sediment trapping facility; see Section 41-3.04.

- If wash rack is used, have the manufacturer design the wash rack to handle the heaviest anticipated traffic loads.

4. Specifications.

- Generally not a pay item as the contractor is required to install and maintain per NPDES permits. If the district feels the necessity to require this item in a specific location, include a District Special Provision. Ensure the wash area has a stabilized construction entrance.

- See *Illinois Urban Manual* practice STD 930 (Stabilized Construction Entrance).

- See *Illinois Urban Manual* STD Drawing IL-630 (Stabilized Construction Entrance Plan) as a plan sheet.

Note: Use IDOT pay items when incorporating Illinois Urban Manual Standards.

41-3.07 Sediment Control Reference Table

Figure 41-3.C summarizes the SCPs that were discussed in Section 41-3. The figure may be used by the designer as a supplemental tool to ensure that all BMP options have been considered. It should be noted that multiple BMPs may be required from each category in order to provide comprehensive sediment management on the site.

SCP Category	Specific SCP	Appropriate Application	Section
Perimeter Controls	Perimeter Vegetated Buffers	Filtration of all overland sheet flow before discharge to storm sewer, swales, or State waters.	41-3.01(a)
	Perimeter Silt Fence Barriers	Along perimeter of construction sites, streams, channels, and stockpiles; at toe of slopes.	41-3.01(b)
	Perimeter Straw Bale Barriers	Along perimeter of construction sites, streams, channels, and stockpiles; at toe of slopes.	41-3.01(c)
	Perimeter Rolled Barriers	Along perimeter of site, on face and toe of slopes, at grade breaks on exposed soils.	41-3.01(d)
Inlet Controls	Drop Inlet Filter Bags	Drop inlets at grade, especially in paved areas.	41-3.02(a)
	Drop Inlet Silt Fence Barriers	Drop inlets draining up to 1 acre (0.4 ha) of flat land, inlets receiving less than 1 cfs (0.03 cms) shallow sheet flow.	41-3.02(b)
	Drop Inlet Straw Bale Barriers	Drop inlets draining up to 1 acre (0.4 ha) of flat land, inlets receiving less than 0.5 cfs (0.01 cms) shallow sheet flow.	41-3.02(c)
	Drop Inlet Rolled Barriers	Drop inlets draining up to 1 acre (0.4 ha) of flat land, inlets receiving less than 0.5 cfs (0.01 cms) shallow sheet flow.	41-3.02(d)
	Drop Inlet Prefabricated Barriers	Drop inlets draining up to 1 acre (0.4 ha) of flat land, inlets receiving less than 0.5 cfs (0.01 cms) shallow sheet flow.	41-3.02(e)
	Above Grade Inlet Filters	Drop inlets draining small up to 1 acre (0.4 ha) during construction.	41-3.02(f)
	Pipe (Culvert) Inlet Vegetated Buffers	Open grated culvert inlets in areas undergoing permanent seeding, areas up to 1 acre (0.4 ha).	41-3.02(g)
	Pipe (Culvert) Inlet Silt Fence Barriers	Only when timely inlet protection and sediment control by other methods is not possible.	41-3.02(h)
	Pipe (Culvert) Inlet Straw Bale Barriers	Only when timely inlet protection and sediment control by other methods is not possible.	41-3.02(i)

SEDIMENT CONTROL PRACTICES REFERENCE TABLE

Figure 41-3.C

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SCP Category	Specific SCP	Appropriate Application	Page
Temporary Ditch and Slope Checks	Aggregate Ditch Checks	In small open swales or ditches with a tributary area of 10 acres (4 ha) or less, steep swales or ditches with velocities exceeding 4.9 ft/s (1.5 m/s), during the establishment of grassy-linings in temporary or permanent swales or ditches.	41-3.03(a)
	Prefabricated Ditch Checks	In shallow swales or ditches with slopes less than 8%, during establishment of vegetation, in temporary swales where erosion control lining is not warranted due to short service time.	41-3.03(b)
	Rolled Barrier Slope Checks	Along the face of erodible and exposed slopes.	41-3.03(c)
Sedimentation Controls	Sediment Traps	Where sediment laden water is discharged from small areas (<5 acres (<2 ha)); supplemental treatment.	41-3.04(a)
	Sediment Basins	Where sediment laden water is discharged from large areas (>5 acres (>2 ha)); supplemental treatment.	41-3.04(b)
Flocculent Polymers	Batch Treatment	Where extreme turbidity exists and where sediment basin alone is insufficient.	41-3.05(a)
	Flow-Through Treatment	As pretreatment for sediment-laden water before draining to sediment trap or sediment basin.	41-3.05(b)
Entrance/Exit Controls	Stabilized Construction Entrance/Exits	All points of site egress/ingress.	41-3.06(a)
	Tire Wash Stations	Where stabilized entrances/exits are not sufficient to remove all sediment.	41-3.06(b)

SEDIMENT CONTROL PRACTICES REFERENCE TABLE

Figure 41-3.C
(Continued)

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41-4 PREPARING A STORM WATER POLLUTION PREVENTION PLAN

41-4.01 Applicability and Objectives

For projects that will result in the disturbance of 1 acre (0.4 ha) or more of total land area, IDOT is responsible for preparing and updating, as necessary throughout subsequent stages of project implementation, a SWPPP – Form BDE 2342 that meets the requirements listed in Part IV of the NPDES ILR10 permit. The SWPPP is a site-specific, written document that identifies potential sources of pollution that could come into contact with storm water leaving the site, and is to be completed prior to the start of construction. In addition, the SWPPP should describe and ensure the implementation of pollution prevention BMPs that will be used to reduce the pollutants in storm water discharges associated with construction site activity and to ensure compliance with the terms and conditions of the NPDES ILR10 permit.

A SWPPP has both a narrative component, to be placed in the special provisions, and a graphical component, to be inserted into the plans. The narrative includes a description of the site and of each major phase of the project. The graphical component is the ESCP sheets, which consist of maps/plans depicting project phases, drainage attributes, sensitive environmental resources, and locations of pollution prevention BMPs. The parts of the SWPPP regarding the intended sequence of construction operations and any non-storm water discharges affecting the construction area should be initiated in design and updated throughout the project implementation phase.

The information in the following Sections is intended to be used as guidance for completing the preliminary engineering portion of a SWPPP on all applicable sites. Designers are to complete the upper portion of Form BDE 2342, including route, section, county, marked route, project number, and contract number. The outline formatting used in this section references the formatting used in Form BDE 2342.

41-4.02 I. Site Description

The planning phase (Phase I) is an important stage of project development, as this is where all the information is gathered that will be used in the decision-making process throughout the design and implementation of the project. Much of the information required in the SWPPP is collected in the planning phase including a site assessment, a project evaluation, and identification of all potential pollutant sources that will be combined into the Phase I report. This information will be used to address the site limitations and accommodate regulatory requirements.

The objectives of this section are to ensure all relevant information is collected relating to:

- site design limitations (e.g., erosion hazards, infiltration capabilities, upstream tributary flow to the site, runoff calculations, right-of-way analysis, receiving waters);

- regulatory limitations (e.g., NPDES permit requirements, floodplain, wetland, endangered species); and

- potential sources of storm water pollution.

The Site Description is an inventory of the land characteristics and site limitations. It is also an assessment of how these site conditions apply to pollution prevention BMP selection and implementation. The description includes identification of existing soils, hydrology, sensitive environmental resources, and receiving waters at the proposed project site and in the project vicinity. Include the following in Section I of Form BDE 2342:

A. Provide a description of the project location (including latitude and longitude).

B. Include a description of the construction activity (e.g., road widening, adding a turn lane).

C. Provide the estimated duration of the project.

D. Provide the total area of the construction site, and the total area of the site that will be disturbed by excavation, grading, or other activities, including dedicated off-site borrow and fill areas.

E. Provide the weighted average of the runoff coefficient for the project after construction activities are completed.

F. List all soils found within project boundaries. Include map, unit name, slope information, and erosivity.

   For soil maps and other resources, see the Natural Resources Conservation Service Web Soil Survey at www.websoilsurvey.nrcs.usda.gov/app. This online interface provides identification, mapping, and quantification of soil characteristics within a user-specified area of interest. Soil survey data may also be collected from published soil survey reports, where available. It is important, however, that field studies are performed in order to verify the accuracy of online data, especially when work is to be performed adjacent to sensitive areas.

   Soils can be highly variable within project boundaries, especially for roadway development, as these projects often disturb soils from a variety of landscape positions, elevations, and orientations. Susceptibility to erosion is a function of particle size, slope, and exposure time. Discuss intermediate stages of development as it relates to soil exposure.

G. Identify any on-site hydric soils and provide an estimate of the number of acres that will likely be disturbed. Give hydric soils and soils that are highly susceptible to erosion greater attention with regard to appropriate pollution prevention BMP selection.

H. Provide a description of potentially erosive areas associated with this project. Include location along proposed roadway, as well as the soils and slopes present in the erosive area.

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I. Provide a description of the intended sequence of soil-disturbing activities by stages, locations, and erosive factors (e.g., steepness of slopes, length of slopes). Discuss any regrading of roadside drainage features and changes to right-of-way.

J. Projects exposing areas of one acre (0.4 ha) or more will also require an ESCP, include associated details and staging construction plans, where applicable. The erosion control plans and/or drainage plans are to meet all requirements outlined in *BDE Manual* Chapter 63 for plan preparation and should contain the following information:

1. Drainage Patterns. Indicate how storm water will drain from the site throughout all phases of the project development and after final stabilization. Include all conveyance channels (e.g., ditches, streams, MS4s (identify operator of MS4)).

2. Slopes. Show the approximate slopes anticipated before and after major grading activities.

3. Entrance and Exit Controls. Identify locations where vehicles enter or exit the site and controls to prevent off-site sediment tracking (to be added after contractor identifies locations).

4. Areas of Soil Disturbance. Provide the limits of soil-disturbing activities.

5. Structural and Non-Structural Controls. Identify any temporary or permanent BMPs in place prior to construction, as well as the location of areas where BMPs are expected to occur. Temporary BMPs include ECPs and SCPs. Permanent BMPs are structures that remain after construction is complete (e.g., detention basins, infiltration basins, sediment basins, oil and grit separators, lined ditches, energy dissipaters). Describe how the existing BMPs will be impacted by the project and how these practices will be incorporated into or modified during project implementation.

6. Points of Discharge. Locate points of discharge and all waterway(s) that would receive storm water from the site, including streams, rivers, lakes, and wetlands.

Some sites may require unique details to describe site-specific BMP applications. Pollution prevention BMP details other than the ones shown in the *IDOT Highway Standards* and *IDOT CADD Roadway Drafting Reference Guide* are to be submitted to the Program Development Engineer for approval. Typically, a site-grading plan will be used for the base for the ESCP as it is necessary to locate limits of disturbed areas and discharge points when designing the ESCP.

K. Identify the ownership or jurisdiction of the drainage system (municipality or agency) the project will drain into, including all associated surface waters and drainage channels.

L. List the receiving water(s), including the ultimate receiving water(s), and describe the location of the project with respect to the receiving waters. Show the location of the receiving waters on ESCP. Also, describe the aerial extent of any wetland acreage at the site.

M. Describe areas of the site that are to be protected or remain undisturbed. These areas may include steep slopes, highly erodible soils, streams, stream buffers, specimen trees, natural vegetation, nature preserves, etc. Identify the pollution prevention BMPs that will be used to protect these areas.

N. Use the checklist provided in Section I.N of Form BDE 2342 to identify all sensitive environmental resources on or adjacent to the project site that will have the potential to be impacted by the proposed development. Explain what measures will be taken to protect these resources. These features may require greater protection measures and/or possible mitigation procedures. The following are examples of sensitive environmental resources that may be associated with this project, and may have the potential to be impacted by the proposed development:

1. Floodplain. Floodplains and floodways are mapped and regulated by the Federal Emergency Management Agency (FEMA), Illinois Department of Natural Resources – Office of Water Resources (IDNR-OWR) and local regulations.

   - Refer to the Phase I Report (see Chapter 12 of *BDE Manual*). If the report is not completed, contact the report writer.
   - Once floodplain information has been provided, delineate floodplain and floodway boundaries on ESCP.
   - Stake boundaries in the field to notify construction crews of floodplain/ floodway limits. Use construction barrier fencing or stakes to protect these areas and sign as necessary.
   - Identify potential sources of pollutants to floodplain.
   - Identify discharge locations.
   - Provide protective measures to control sediment or erosion in the floodplain; i.e., double rows of silt fence, filter strips, velocity dissipaters (check dams), vegetation (seed/sod).
   - Treat floodplains like receiving waters.
   - No fill in the floodplain should occur prior to obtaining a permit from applicable agencies.
   - Do not allow stockpiles to be located in the floodplain/floodway.
   - Information on Executive Order 11988 requirements applicable to floodplains can be found in Section 26-7 of the *BDE Manual*.

2. Wetlands and Riparian Areas. Wetlands are regulated by the US Army Corps of Engineers (Corps) under Section 404 of the *Clean Water Act*, the State of Illinois under the *Illinois Interagency Wetlands Policy Act* (IWPA), and local regulations.

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- Refer to the Phase I Report (see Chapter 12 of *BDE Manual*). If the report is not completed, contact the report writer.
- Once wetland information has been provided, delineate wetland boundaries and scale the applicable buffer onto the ESCP.
- Stake boundaries in the field to notify construction crews of wetland and wetland buffer limits. Use construction barrier fencing or stakes to protect these areas.
- Identify potential sources of pollutants to wetlands.
- Identify discharge locations.
- Provide protective measures to control sediment or erosion in the wetlands; (e.g., double rows of silt fence, filter strips, velocity dissipaters (check dams), vegetation (seed/sod)).
- Treat wetlands like receiving waters.
- Information on compliance procedures for impacts to wetlands can be found in Section 26-8 of *BDE Manual*.

3. Threatened and Endangered (T&E) Species

- Refer to the Phase I Report (see Chapter 12 of *BDE Manual*). If the report is not completed, contact the report writer.
- If there are aquatic T&E species in the receiving waters, this should be noted on the SWPPP and extra care should be taken to prevent impacts.
- For information on compliance procedures for T&E species, see Section 26-9 of *BDE Manual*.

4. Historic Preservation

- Refer to the Phase I Report (see Chapter 12 of *BDE Manual*). If the report is not completed, contact the report writer.
- For information on historic preservation compliance procedures, see Section 26-5 of *BDE Manual*.

5. 303(d) Listed Receiving Waters. The SWPPP should specifically include BMPs to prevent the discharge of pollutants identified as causing the impairment.

- Provide the name(s) of the listed waterway, and identification of all pollutants causing impairment.

- Provide a description of how ECPs and SCPs will prevent a discharge of sediment resulting from a storm event equal to or greater than a 25-year, 24-hour rainfall event, if the receiving water is listed as impaired for sediment or a parameter that addresses sediment (e.g., total suspended solids, turbidity, siltation).

- If pollutants other than sediment are identified as causing the impairment, provide a description of how pollution prevention BMPs will be incorporated into the site design to prevent their discharge.

- Provide a description of the location(s) of direct discharge from the project site to the 303(d) waterway.

- Provide a description of the location(s) of any dewatering discharges to the MS4 and/or waterway.

- For additional information on 303(d) impaired waters, see Section 26-21 of *BDE Manual*.

6. Receiving Waters with Total Maximum Daily Load (TMDL). For discharges to waters for which there is a TMDL allocation for sediment or a parameter that addresses sediment (e.g., total suspended solids, turbidity, siltation), develop and certify a SWPPP that is consistent with the assumptions and requirements in the approved TMDL. Incorporate any conditions applicable to discharges necessary for consistency with the assumptions and requirements of the TMDL within any timeframes established in the TMDL into the SWPPP.

   - Provide the name(s) of the listed waterway.

   - Provide a description of the erosion and sediment control strategy that will be incorporated into the site design that is consistent with the assumptions and requirements of the TMDL.

   - If a specific numeric waste load allocation has been established that would apply to the project's discharges, provide a description of the necessary steps to meet that allocation.

   - For additional information on TMDL, see Section 26-21 of *BDE Manual*.

7. Applicable Federal, Tribal, State, or Local Programs

   - Include a description of any other Federal, State, Tribal, or local soil and erosion control and storm water management requirements that apply to the site.

   - Ensure the SWPPP complies with both the NPDES ILR10 permit and any applicable local requirements.

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O. Identify the pollutants and sources that are likely to be found on the site. The principle pollutant of concern is sediment, however, other pollutants may be found in storm water runoff from construction sites. These can include nutrients, heavy metals, organic compounds, pesticides, oil and grease, bacteria and viruses, trash and debris, and other chemicals.

Use the checklist in Section I.O. of Form BDE 2342 to inventory all pollutants and pollutant-generating activities that will have the potential to come in contact with storm water.

41-4.03 II. Controls

This section of the plan addresses the controls that will be implemented for each of the major construction activities and for all use areas, borrow sites, and waste sites. Section 41-2 and Section 41-3 provide information regarding various available temporary BMPs and the applications to which each is best suited. The nature and extent of the BMPs should be appropriate to address the specific conditions involved. It is important to note that the districts may require implementation of additional BMPs, if deemed necessary.

A. Erosion and Sediment Controls. The temporary BMP selection process is an iterative process that first identifies potential pollutant sources and then identifies the BMPs necessary to reduce or eliminate pollutant discharges from the site. Select BMPs to eliminate or reduce the pollutants identified in the Pollutant Sources Inventory (Form BDE 2342 Section I.O). Identify all contract-required BMPs and any other BMPs required by the contract special provisions, contract plans, standard plans, and *Standard Specifications*, for each section. If a non-standard BMP will be used, provide a narrative description of its use and implementation. BMPs should address construction of both the roadway and bridge/culvert components of highway/bridge projects.

1. Stabilization Practices. Stabilization practices (ECPs) involve the stabilization of soil particles, either by covering or binding, in order to alleviate raindrop impact and prevent suspension in storm water runoff. Complete the checklist provided in Section II(A)(1) of Form BDE 2342 with all proposed erosion control practices and fully describe the intended use and purpose of each BMP .

   Describe how the stabilization practices will be used during and after construction activities have been completed.

   - Provide a description of interim and permanent stabilization practices, including site-specific scheduling of the implementation of the practices.
   - Ensure site plans preserve existing vegetation where attainable and stabilization is provided for disturbed portions of the site.
   - Section 41-2 provides guidance on the selection of ECPs that may be used for the project.

2. Structural Practices. Structural practices (SCPs) are used in conjunction with the selected ECPs as secondary treatment measures. SCPs are designed to capture and contain suspended solids within site runoff via settling or filtration. Complete the checklist provided in Section II(A)(2) of Form BDE 2342 for all proposed SCPs and fully describe the intended use and purpose of each BMP.

   - Describe how the structural practices will be used during and after construction activities have been completed.
   - Address structural practices to be implemented at the site perimeter (e.g., site entrances, exits), at the base of disturbed slopes, at storm sewer inlets, and for all other activities that generate suspended solids.
   - Address structural practices that will be implemented, to the degree attainable, to divert flows from exposed soils, store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site.
   - Section 41-3 provides guidance on SCPs that may be used for the project.
   - Select the practice that ensures sediment will be intercepted and contained close to its source on the project site.

3. Storm Water Management Practices. Describe storm water management practices (permanent BMPs) that will be installed during the construction process to control pollutants in storm water discharges that will occur after construction operations have been completed. The installation of these devices may be subject to Section 404 of the *Clean Water Act*.

   - Address the installation, maintenance, and any temporary use of these practices for sediment control prior to final stabilization of the site.
   - These practices should be determined based on the technical guidance provided in Sections 41-2 and 41-3. If practices other than those discussed in Sections 41-2 and 41-3 are selected for implementation or if practices are applied to situations different from those covered in these Sections, provide an explanation of the technical basis for these decisions.

4. Approved State or Local Laws. This may require additional information from the designer, but the Department is normally not subject to local ordinances.

41-4.04 III. Maintenance

Maintenance guides for commonly specified BMPs are available from the Department. If the designer specifies a BMP that the Department has not yet developed a maintenance procedure,

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the designer is to include the necessary installation and maintenance requirements in the specifications.

41-4.05 Contractor Certification Statement – Form BDE 2342a

Designer is to fill out the top portion of this form describing the project. After project has been let, the resident engineer will acquire signatures from the contractor and any subcontractors.

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41-5 REFERENCES

1. *Illinois Urban Manual*, 2002 and latest revisions.

2. *IDOT Standard Specifications for Road and Bridge Construction*, Illinois Department of Transportation, 2007 and latest revisions.

3. *BMP Handbook*, California Department of Transportation.

4. *IDOT Highway Standards*, Illinois Department of Transportation, latest revisions.

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